

REMARKS

Claims 34-53 are pending in the present application. In the Office Action mailed July 6, 2009, the Examiner rejected claims 34-53 under 35 U.S.C. §102(e) as being anticipated by Larson et al. (US Pub. 2004/0155653).

Applicant has amended claim 1 to correct a typographical error.

Inaccurate Assertions Made by the Examiner:

Throughout examination of this matter, the Examiner has repeatedly asserted that “non-imaging data … is equivalent to non-spatially encoded data.” *Office Action*, 07/06/2009, pg. 2; *Office Action*, 09/13/2007, pg. 2-4; *Advisory Action*, 05/30/2008, pg. 2. As such, according to the Examiner, non-imaging data does not include spatially encoded data. This statement is simply not accurate. Applicant has repeatedly brought this inaccuracy to the Examiner’s attention. *Response*, 08/15/2007, pg. 8; *Response*, 11/13/2007, pg. 8; *RCE Response*, 07/18/2008, pg. 6.

As immediately and well understood by those skilled in the art, not all non-imaging data is non-spatially encoded; therefore, non-imaging data is not exclusively non-spatially encoded data. Simply put, all MR data, both spatially encoded and non-spatially encoded data, not used to produce an image is non-imaging data. In contrast, MR data used to produce an image is understood by those skilled in the art to be imaging data. Indeed, Larson et al. defines imaging data in much the same manner. *Larson et al.*, ¶ [0057] (stating that imaging data is “data that is used to produce MR images, and not … data that is acquired exclusively for other purposes, e.g., additional data acquired solely to provide timing information”). There are techniques that utilize non-imaging data that is spatially encoded (i.e., data acquired in the presence of a frequency gradient, G_x, and/or a phase encoding gradient, G_y). Since all non-imaging data is not non-spatially encoded, non-imaging data is not equivalent to non-spatially encoded data. To serve as an analogy, all apples may be a fruit, but not all fruits are apples, therefore fruits (non-imaging data) are not equivalent to apples (non-spatially encoded data).

As stated above, Applicant has repeatedly brought to the Examiner’s attention that non-imaging data is not equivalent to non-spatially encoded data. Applicant also submitted a Supplemental IDS that included a reference that discloses a classic example of non-imaging data that is spatially encoded (navigator echo data) – an example that directly contradicts the Examiner’s inaccurate assertion that non-imaging data is equivalent to non-spatially encoded data. *Supp. IDS*, 07/08/2008 (citing the “reference,” Ehman & Felmlee, “Adaptive technique for

high-definition MRI of moving structures," Radiology, 173:255-263 (1988) (hereinafter Ehman et al.)).

It is noted that Ehman et al. was cited in Larson et al. *Larson et al.*, ¶ [0009]. Indeed, Larson et al. itself relies on Ehman et al. to support the following statement:

In the area of respiratory gating, a technique known as navigator gating or navigator echo derives a timing signal from extra, non-imaging data. Ehman & Felmlee, "Adaptive technique for high-definition MRI of moving structures." Radiology, 173:255-263 (1988).

Id. (emphasis added).

As clearly shown in Ehman et al., the navigator echo disclosed therein is acquired as the spatial encoding gradient, G_x, is applied. *Ehman et al.*, Fig. 2. Since the navigator echo is acquired while a spatial encoding gradient is applied, the acquired data is spatially encoded. This navigator echo is used to determine "x-axis displacement information." *Id.* at pg. 25. The spatially encoded data (i.e., the navigator echo data) is then used to correct the imaging data. *Id.* at pgs. 256-257. The images are created from the imaging data - not the navigator echo data. *Id.* It is clear from Ehman et al. that the timing signal is acquired from spatially-encoded MR data. Further, it is clear from Ehman et al. and Larson et al (see block quote above) that the spatially-encoded MR data used for timing is non-imaging data. As such, Ehman et al. clearly discloses spatially-encoded non-imaging data, which shows, contrary to the Examiner assertion, that non-imaging data is not equivalent to non-imaging data.

Nonetheless, despite Applicant's repeated attempts to explain and show the Examiner that non-imaging data is not equivalent to non-imaging data, the Examiner once again, in the present Office Action, repeats the unsubstantiated assertion that non-imaging data is equivalent to non-spatially encoded data. *Office Action*, 07/06/2009, pg. 3. Instead of proffering evidence to support such an assertion, the Examiner stated that non-imaging data is equivalent to non-spatially encoded data "because spatial encoding is inherently necessary in MRI in order to form an image." The Examiner's justification (i.e., that spatial encoding is inherently necessary in MRI in order to form an image), however, has nothing to do with the Examiner's assertion. Just because spatial encoding may be necessary to form an image does not mean that non-imaging data must therefore be non-spatially encoded.

Larson et al. does not teach or suggest the use of non-spatially encoded MR data. Rather, Larson et al. merely states that timing information may be extracted from MR imaging data or "from a combination of MR imaging data and additional non-imaging data." *Larson et al.* at ¶

[0020]. In other words, according to Larson et al., “timing information may be extracted from MR data not used as MR imaging data.” *Id.* at ¶ [0025]. Nowhere does Larson et al. teach or suggest that timing information, let alone the determination of motion, is based on non-spatially encoded MR data.

Despite, repeated explanations and the proffered evidence (Ehman et al.), the Examiner still sets forth that non-imaging data is equivalent to non-spatially encoded data.

35 U.S.C. § 102(e):

The Examiner rejected claim 34 under § 102(e) as being anticipated by Larson et al. Applicant respectfully disagrees. Larson et al. does not teach or suggest each and every element of claim 34.

Claim 34 calls for, in part, a magnetic resonance (MR) imaging apparatus having a computer programmed to determine motion in a region of interest (ROI) based on MR motion data comprising non-spatially-encoded MR data and additional non-spatially-encoded MR data.

Larson et al. does not teach or suggest the determination of motion based on MR motion data that includes non-spatially-encoded MR data or additional non spatially-encoded MR data. The Examiner asserted that since Larson et al. suggests that “timing information” may be extracted from non-imaging data, Larson discloses the determination of motion based on MR data that includes non-spatially encoded data. This is simply not accurate.

As discussed above and repeated in previous communications with the Examiner, non-imaging data is not equivalent to non-spatially encoded data. Though Larson et al. may suggest extracting timing information from non-imaging data, Larson et al. does not suggest extracting timing information from non-spatially encoded data. See *Larson et al.* Nowhere in Larson et al. is it taught or suggested that the non-imaging data disclosed therein is non-spatially encoded data.

Accordingly, Larson et al. does not teach or suggest a magnetic resonance (MR) imaging apparatus having a computer programmed to determine motion in a region of interest (ROI) based on MR motion data comprising non-spatially-encoded MR data and additional non-spatially-encoded MR data, as set forth in claim 34.

Larson et al. also does not teach or suggest an MR imaging apparatus having a computer programmed to sample non-spatially-encoded MR data of a central region of k-space from a region-of-interest (ROI), as set forth in claim 34. Larson et al. does suggest the acquisition of MR data from points at or near the center of k-space. *Id.* at ¶ [0017] (stating that “timing information may be extracted from frequently collected k-space points at or near the origin”).

However, Larson et al. clearly states that such data in MR “imaging data.” *Id.* Accordingly, the data is spatially encoded – it is not non-spatially encoded MR data. Again, it is noted that simply because imaging data is spatially encoded does not mean that non-imaging data must be non-spatially encoded. Nonetheless, Larson et al. suggests the acquisition of spatially-encoded imaging data from the center of k-space – not a sampling of non-spatially-encoded MR data of a central region of k-space, as set forth in claim 34. For substantially similar reasons, Larson et al. also does not teach or suggest the sampling of additional non-spatially-encoded MR data of a central region of k-space, as set forth in claim 34.

Since Larson et al. fails to teach or suggest each and every element of claim 34, Applicant respectfully requests withdrawal of the § 102(e) rejection of claim 34, and those claims depending therefrom.

The Examiner rejected claim 44 under § 102(e) as being anticipated by Larson et al. Applicant respectfully disagrees. Larson et al. fails to teach or suggest that which is called for in claim 44.

For example, Larson et al. fails to teach or suggest a computer readable storage medium having a computer program thereon that causes a computer to acquire a first and a second set of central k-space magnetic resonance (MR) data from a region-of-interest (ROI) at a time other than during an application of frequency and phase encoding gradients, as set forth in claim 44. It is noted that MR data that is acquired in the absence of phase and frequency encoding gradient is not spatially encoded (i.e., the data is non-spatially-encoded MR data), because indeed, it is the phase and frequency encoding gradients that spatially encode MR data.

The Examiner asserted, or at least inferred, that Larson et al. suggests acquiring non-imaging data as a k-space trajectory passes through the k-space origin and, therefore, Larson et al. discloses the acquisition of central k-space data at a time other than during an application of frequency and phase encoding gradients, as set forth in claim 44. *Office Action*, 07/06/2009, pg. 4. First, Larson et al. does not teach or suggest the acquisition of non-imaging data as a k-space trajectory passes through the k-space origin. *See Larson et al. at ¶ [0036].* Rather, Larson et al. teaches the acquisition of “MR imaging data” as a k-space trajectory passes through the k-space origin. *Id.*

Next, as discussed at length above, Larson et al. does not teach or suggest the acquisition of non-spatially-encoded data (i.e., data acquired at a time other than during an application of frequency and phase encoding gradients), as set forth in claim 44.

Accordingly, Larson et al. fails to teach or suggest each and every element of claim 44. Applicant, therefore, respectfully requests withdrawal of the § 102(e) rejection of claim 44, and those claims depending therefrom.

The Examiner rejected claim 48 under § 102(e) as being anticipated by Larson et al. Applicant respectfully disagrees, Larson et al. fails to teach or suggest each and every element of claim 48.

In particular, Larson et al. fails to teach or suggest sampling a central region of k-space associated with a region-of-interest (ROI), where the sampling of the central region of k-space occurs prior to any application of spatial-encoding gradients during the repetition time interval such that a first non-spatially encoded data set is obtained, as set forth in claim 48. Larson et al. does not teach or suggest the sampling of non-spatially encoded data associated with a central region of k-space. In contrast, Larson et al. teach the sampling of imaging data from the central region of k-space. *Larson et al.* at ¶ [0017].

Larson et al. also does not teach or suggest determining motion in a region of interest based on motion data that is free of spatially encoded MR data, as set forth in claim 48. Larson et al. merely suggests the extraction of “timing information” from “non-imaging data.” Larson et al. does not teach or suggest the determination of motion based on non-spatially-encoded data.

Accordingly, Larson et al. fails to teach or suggest each and every element of claim 48. As such, Applicant respectfully request withdrawal of the § 102(e) rejection of claim 48, and those claims depending therefrom.

Therefore, in light of at least the foregoing, Applicant respectfully believes that the present application is in condition for allowance. As a result, Applicant respectfully requests timely issuance of a Notice of Allowance for claims 34-53.

Applicant appreciates the Examiner’s consideration of these Amendments and Remarks and cordially invites the Examiner to call the undersigned, should the Examiner consider any matters unresolved.

Dated: September 8, 2009
Attorney Docket No.: GEMS8081.231

Respectfully submitted,

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General Authorization and Extension of Time

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 07-0845. Should no proper payment be enclosed herewith, as by credit card authorization being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 07-0845. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extensions under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 07-0845. Please consider this a general authorization to charge any fee that is due in this case, if not otherwise timely paid, to Deposit Account No. 07-0845.

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